

REMARKS

Claims 1, 3-7, 10-15, 17-20, 25, and 28-34 were previously pending in this application. Claim 29 has been cancelled. As a result, claims 1, 3-7, 10-15, 17-20, 25, 28, and 30-34 are pending for examination with claims 1, 20, and 25 being independent claims. No new matter has been added.

Claim Objections Under 37 CFR 1.75 (c)

Claim 29 is objected to under 37 CFR 1.75 (c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Claim 29 has been cancelled and accordingly this objection is now moot.

Rejections Under 35 U.S.C. § 112

Applicant respectfully thanks the Examiner for withdrawing the previous rejection of claim 34 under 35 U.S.C. 112.

Rejections Under 35 U.S.C. §103

Applicant respectfully thanks the Examiner for withdrawing the previous rejection of claims 1, 20 and 25 under 35 U.S.C. §103(a) over Bray in view of Al-Samadi.

Claims 1, 3-7, 10, 17-18, 20-23, 25 and 28-34 are rejected under 35 U.S.C. §103(a) as being unpatentable over Daly et al. (U.S. Patent No. 6,120,688), hereinafter “Daly”, in view of Al-Samadi et al. (U.S. Patent No. 5,501,798), hereinafter “Al-Samadi.”

Applicant disagrees that independent claim 1, 20, and 25, as amended, would have been obvious to one of ordinary skill in the art over the teaching of Daly in view of Al-Samadi.

The teaching of Daly discloses a method of purifying impure water comprising providing a microfiltration unit, at least one reverse osmosis unit and a clean-in-place (CIP) tank that collects the concentrated retentate for later use. The concentrated retentate is filtered through a 10 micron filter and is then used to backwash the microfiltration unit. (Daly at col. 2, line 55 – col. 3, line 21; and col. 6, lines 45-67.) As the specification of the present invention acknowledges and as depicted in Daly, conventional filtration systems typically include an ultrafiltration or microfiltration unit in conjunction with a reverse osmosis membrane (specification at page 1, lines 14-16).

The teaching of Al-Samadi discloses a filtration system that does not utilize any backwashing step. The filtration system uses techniques, such as controlling the rate of removal of retentate from the high pressure side of the reverse osmosis unit to control precipitation, and adding precipitating agents, antiscalants and solubilizing agents to the filtration system to prevent fouling and scaling of the filtration units. (Al-Samadi at col. 4, lines 38-41 and col. 5, lines 26-30.) The retentate of the reverse osmosis membrane is not used to backwash a primary microfiltration or ultrafiltration unit as presently claimed, and is instead disposed of as a filter cake, or recycled to the source of waste water.

As noted by the Examiner, the teaching of Al-Samadi discloses improved methods for extending the useful life of a reverse osmosis membrane. (see Office Action at page 7.) The life of the reverse osmosis membrane is extended by removing retentate from the high pressure side of the reverse osmosis membrane at a rate sufficient to avoid precipitation of constituents on the membrane. The teaching of Al-Samadi emphasizes that the rate of removal from the high pressure side of the reverse osmosis membrane is important to avoid precipitation on the membrane and to avoid interference with its ability to operate at high efficiency. (Al-Samadi at col. 4, line 35-41; col. 5, lines 10-19; and col. 6, lines 9-15; and lines.) In sum, the teaching of Al-Samadi focuses on operating the reverse osmosis membrane efficiently, with no disclosure, teaching or suggestion of backwashing any microfiltration or ultrafiltration membrane disclosed by Al-Samadi.

In contrast to Al-Samadi, the teaching of Daly emphasizes backwashing the microfiltration unit. As noted by the Examiner, the Declaration of Joseph Zuback ("Zuback Declaration"), filed on June 26, 2008, states that the purpose of the 10 micron filter (54) of Daly is to protect the reverse osmosis membrane. (Zuback Declaration, paragraph 4.). However, this statement has been used by the Examiner out of the context of the Zuback Declaration. The statements following this sentence in the Zuback Declaration explain in detail the insufficiency of the 10 micron filter of Daly to protect the reverse osmosis membrane, specifically, that the 10 micron filter cannot protect the reverse osmosis membrane from materials generated within the filtration system that are smaller than 10 microns, which could pass through the 10 micron filter and damage the reverse osmosis membrane. The Zuback Declaration also supports what the specification of the present invention discloses (specification at page 2, lines 7-20) regarding Daly's lack of recognition that materials can originate within the reverse osmosis membrane

modules, which a 10 micron filter as used in Daly would be unable to remove. Specifically, the teaching of Daly does not recognize the significance of the materials that may be produced on the concentrated (retentate) side of the reverse osmosis unit. (Specification at page 2, lines 13-15; and Zuback Declaration at paragraph no. 6.) These materials cannot be filtered out by a 10 micron filter, and would thereby damage the reverse osmosis membrane during operation and the microfiltration/ultrafiltration unit during backwashing. (Zuback Declaration, paragraph 6.) Further, bacterial colonies may form on the reverse osmosis membrane that may slough off of the membrane and exit the module with the reverse osmosis retentate (specification at page 2, line 20; and Zuback Declaration at paragraph 7), and the 10 micron filter of Daly would not be able to filter out the bacterial flocculant particles prior to backwashing. (Zuback Declaration, paragraph 7.) Additionally, the use of a CIP tank in Daly (which the present invention does not use) to collect and store the concentrated retentate directly from the reverse osmosis membrane also can contribute to precipitation of materials that would not be filtered out by a 10 micron filter, and would damage the reverse osmosis membrane during operation and the "clean side" of the microfiltration unit during backwashing.

In contrast to Daly, the present invention recognizes the problems associated with foulants being formed in the retentate and/or the reverse osmosis membrane surface. The present invention directly addresses these problems by using a microfiltration or ultrafiltration downstream of the reverse osmosis retentate stream to filter out materials which would pass through a coarser filter. This secondary microfiltration or ultrafiltration membrane assures removal of foulants that Daly does not even recognize as being present, including those formed by or originating from the reverse osmosis unit to produce filtered saline solution and to protect the "clean side" of the primary microfiltration or ultrafiltration membrane during backwashing.

Daly does not recognize the need for materials to be removed from the reverse osmosis retentate, and in no way teaches or suggests that the 10 micron filter is insufficient to accomplish its stated goals. Thus, one of ordinary skill in the art reviewing Daly would not have been motivated to modify the 10 micron filter to a more costly alternative, in terms of operation and installment, such as a microfiltration or ultrafiltration membrane as presently claimed.

Additionally, the teaching of Daly emphasizes the need to backwash the microfiltration unit. In contrast, the teaching of Al-Samadi focuses on increasing the life of the reverse osmosis unit by removing retentate from the high pressure side of the membrane at a rate sufficient to

avoid precipitation on the membrane, while not disclosing backwashing of any type of filtration unit. Thus, one of ordinary skill in the art focusing on backwashing of a microfiltration unit, while not recognizing the necessity of using a filter that is less coarse than 10 microns to protect the reverse osmosis unit, would not have been motivated to look to a teaching that focuses on the protection of the reverse osmosis unit and that does not even suggest backwashing a microfiltration unit of the system. Therefore, there can no motivation to combine the teaching of Al-Samadi with the teaching of Daly, and one or ordinary skill in the art would not have made the proposed combination in the manner suggested by the Examiner. Applicant finds no suggestion to combine the teachings and suggestions of Daly and Al-Samadi, as advanced by the Examiner, except from using Applicant's invention, including the passages of the specification that discuss the issues with Daly, as a template through a hindsight reconstruction of Applicant's claims.

Even if the references could have been combined, any resultant combination would lack each and every element of the claimed invention. As the Examiner notes, the 10 micron filter of Daly is not the same as the secondary microfiltration or ultrafiltration device as presently claimed. (Office Action at page 6, first and second paragraph.) Therefore, Daly does not disclose each and every element of independent claims 1, 20 and 25.

The teaching of Al-Samadi does not cure the deficiencies of Daly. The teaching of Al-Samadi does not disclose backwashing of a primary microfiltration or ultrafiltration unit, nor does it assign any importance to an optional "microfiltration membrane, sand-bed filtration with or without flocculant addition, dead-end cartridge filtration or a combination of these" that may be placed upstream of the reverse osmosis membrane to remove suspended solids from a wastewater stream. (Al-Samadi at col. 4, lines 18-22.) Even with this additional filter in place, Al-Samadi still does not disclose filtering the reverse osmosis retentate through a secondary microfiltration or ultrafiltration membrane filter to produce a filtered saline solution that is then used to backwash a primary microfiltration or ultrafiltration unit. Al-Samadi only teaches recycling of the filtrate or retentate from a microfiltration or ultrafiltration unit in the system, using various chemical agents to prevent fouling and scaling of the filtration units, and controlling the rate of removal of retentate to control precipitation. The combination of Daly and Al-Samadi would have produced a filtration system that uses other techniques in place of backwashing to minimize fouling of the reverse osmosis membrane and the ultrafiltration unit of

Daly.

Thus, independent claims 1, 20, and 25 are patentable over the teaching of Daly in view of the teaching of Al-Samadi because there is no *prima facie* case of obviousness. For at least the same reasons, dependent claims 3-7, 10, 17-18, and 28, and 30-34, which depend directly or indirectly from independent claims 1 and 25, are patentable.

Accordingly, reconsideration and withdrawal of the rejection of claims 1, 3-7, 10, 17-18, 20, 25, and 28, and 30-34 under 35 U.S.C. § 103(a) is respectfully requested.

Dependent claims 11-15, 19 and 34 are rejected under 35 U.S.C. §103(a) as being unpatentable over Daly, in view of Al-Samadi et al., as applied to claims 1 and 25, and further in view of Water Encyclopedia (Jay Lehr, editor, John Wiley & Sons, Inc., New York, 2005 hereinafter “Encyclopedia”).

Applicant disagrees that claims 11-15, 19, and 34 would have been obvious to one of ordinary skill in the art over the teaching of Daly in view of Al-Samadi, as applied to claims 1 and 25. As discussed, the rejection is improper because no *prima facie* case of obviousness has been established. The alleged combination would lack at least one recited element.

The Encyclopedia teaches generally methods and treatments of purifying water. The various chemical, radiation, and physical treatments taught in Encyclopedia are intended to further purify the stream to provide drinkable water. One of ordinary skill in the art looking to use a reverse osmosis retentate to backwash a microfiltration unit as in Daly, would not have been motivated to then treat the retentate to purify and enhance it, as suggested by the Examiner. Additionally, the deficiencies of Daly in view of Al-Samadi are not cured by the teaching of Encyclopedia. The Encyclopedia does not disclose, teach or suggest a method, as recited in claims 11-15, and 19, or a system, as recited in claim 34. Therefore, the combined teachings of Daly in view of Al-Samadi, and further in view of Encyclopedia, would have failed to disclose each and every element of the claimed invention.

For at least the same reasons mentioned above, claims 11-15, 19, and 34 would not have been obvious over the teaching of Daly in view of Al-Samadi, as applied to claims 1 and 25, and further in view of the Encyclopedia.

Accordingly, reconsideration and withdrawal of the rejection of these claims under 35 U.S.C. § 103(a) is respectfully requested.

CONCLUSION

In view of the foregoing amendments and remarks, reconsideration is respectfully requested. This application should now be in condition for allowance; a notice to this effect is respectfully requested. If the Examiner believes, after this amendment, that the application is not in condition for allowance, the Examiner is requested to call the Applicant's attorney at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/2762 (Ref. No. M2019-7022US).

Respectfully submitted,
Joseph Edward Zuback, Applicant

By: /Sandra Szela Congdon/
Peter C. Lando, Reg. No. 34,654
Sandra Szela Congdon, Reg. No. 60,655
LANDO & ANASTASI, LLP
One Main Street
Cambridge, Massachusetts 02142
United States of America
Telephone: 617-395-7000
Facsimile: 617-395-7070
Attorneys for Applicant

Siemens Ref. No.: 2004P87070WOUS

Memcor Ref. No.: IPD-C337-US

LL Ref. No.: M2019-7022US